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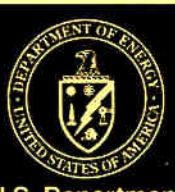
Guidance for Implementing the Long-Term Surveillance Program For UMTRCA Title I and Title II Disposal Sites

April 2001



U.S. Department of Energy

GRAND JUNCTION OFFICE

Work Performed Under DOE Contract No. DE–AC13–96GJ87335 for the U.S. Department of Energy

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LGPF 1.2

Long-Term Surveillance and Maintenance Program

Guidance for Implementing The Long-Term Surveillance Program For UMTRCA Title I and Title II Disposal Sites

April 2001

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Grand Junction Office
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Work Performed Under DOE Contract Number DE-AC13-96GJ87335
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Contents

Table

Attachments

Acronyms and Initialisms

AEA	Atomic Energy Act
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
DOE	U.S. Department of Energy
EM	Environmental Management
EPA	U.S. Environmental Protection Agency
LTS	Long-Term Stewardship
LTSP	long-term surveillance plan
NARA	National Archives and Records Administration
NEPA	National Environmental Policy Act
NRC	U.S. Nuclear Regulatory Commission
RCRA	Resource Conservation and Recovery Act
ROD	Record of Decision
SDWA	Safe Drinking Water Act
TSCA	Toxic Substances Control Act
UMTRCA	Uranium Mill Tailings Radiation Control Act

1.0 Purpose and Scope

This document provides guidance for preparation of site-specific long-term surveillance plans (LTSP) for Title I and Title II sites established by the Uranium Mill Tailings Radiation Control Act (UMTRCA) (42 USC §7901 *et seq.*). This guidance may by used to prepare LTSPs (or site operation plans) for other types of disposal sites under DOE custody as well.

Requirements for long-term surveillance, monitoring, and maintenance of UMTRCA Title I and Title II sites, to protect public health and safety and the environment, are provided in U.S. Nuclear Regulatory Commission (NRC) regulations 10 CFR Part 40, specifically §40.27, §40.28, and Appendix A (Attachment 1).

End of current text

2.0 Long-Term Surveillance Plan

The NRC regulations require that each LTSP include descriptions of the disposal site and disposal cell, final disposal site conditions, the surveillance program, and criteria for follow-up inspections and site maintenance.

LTSPs may reference information in documents previously submitted to the NRC, (10 CFR §40.27(b), §40.28(b)).

2.1 Purpose and Scope of Site-Specific LTSPs

An LTSP must state its purpose and scope. Its purpose is first, to comply with NRC regulatory requirements and second, to facilitate the long-term care of the disposal site. The LTSP also describes baseline conditions for comparisons over time. LTSPs are site-specific.

2.2 Legal Site Description

The LTSP must include a legal description of the disposal site (10 CFR §40.27(b)(1), §40.28(b)(1)).

The site description contains the number of acres included in the site. It also includes the type of real estate instruments associated with conveying the site from the affected state or licensee to the United States or the negotiation of a custodial agreement between the U.S. Department of Energy (DOE) and tribes.

Documents containing information associated with the land transaction (e.g., book, page, county, state, and date for deeds; *Federal Register* number and date for Public Land Order transfers of jurisdiction; and tribal custody and access agreements) should be listed in the LTSP, with the following statement:

Real estate correspondence and instruments are maintained and filed by the Property Management Branch and Administrative Services Property Division, Albuquerque Operations Office.

The LTSP will also state that copies of all real estate documents will be maintained in the permanent site file.

A surveyor's description of the property as recorded and filed at the county seat (or equivalent office) is attached to the LTSP. It includes the township, range, and section (nearest quarter section) or equivalent system (e.g., metes and bounds).

2.3 Final Disposal Site Conditions

An LTSP summarizes final disposal site conditions, as a baseline for comparisons over time. The comparisons are made during site inspections described in Section 2.4 below. The site-specific remedial action plan (RAP) or reclamation plan, as-builts, and completion report should be summarized and referenced for more details.

The LTSP also summarizes the final disposal site description, ground water conditions; and for Title I sites, planned ground water protection activities as required by 10 CFR §40.27(b)(2). This description (in the LTSP or a referenced document) must be detailed enough that inspectors can determine changes from baseline conditions and determine when these changes require maintenance or repairs.

2.3.1 Processing History and Associated Contaminants

The LTSP also summarizes historical information related to surface and ground water (e.g., years of operation, processes, and volume of material processed), and references other site documents for more processing details so the quantity and quality of the tailings stabilized in the cell are understood by the regulators and inspectors.

2.3.1.1 Hazardous Constituents In Stabilized Tailings

An LTSP identifies constituents with established maximum concentration limits (MCL), other hazardous constituents listed in Appendix I of 40 CFR Part 192 or Appendix A Criterion 13 of 10 CFR Part 40, for Title I or Title II sites, respectively, and hazardous constituents of concern that are present in or reasonably derived from the tailings stabilized in the disposal cell.

For most sites, hazardous constituents are identified (in the site RAP or reclamation plan) by sampling and analyzing tailings pore water and by subsequent ground water characterization. In addition to chemical analysis of tailings pore fluids, the LTSP summarizes other factors that could result in constituents being added to or removed from the list of hazardous constituents proposed in the RAP or reclamation plan. These factors include, but are not limited to the following:

- The chemical composition of the raw ore.
- Chemical agents used for uranium extraction.
- Chemical analysis data from sampling collection ponds, subsurface soils, or contaminated ground water at the processing site.
- The chemical properties of Appendix I (40 CFR Part 192) or Appendix A, Criterion 13 (10 CFR Part 40) compounds when they come into contact with water (e.g., stability and solubility).

The LTSP also discusses other water quality parameters of the disposal site environment that may explain or predict potential contaminant migration. Pore water data and other data used to characterize the disposal material may be summarized in a table that also summarizes background and/or on-site contaminant concentrations.

2.3.2 Description and Location of the Disposal Site Area

The as-built and current descriptions of the disposal site area in the LTSP should include the following information:

- A figure locating the disposal site within the region (e.g., state, county, nearby towns, highways, major waterways).
- A road log or figure with instructions for traveling to the site.
- Land use, surface and ground water use, and land ownership of the surrounding areas.
- Surface features of the disposal site including topography, drainage patterns, natural or cultural resources, surface waters, and physiographic setting.
- Vegetation on and around the cell at completion as well as a description and assessment of anticipated volunteer plant growth (see section 2.3.3).
- Subsurface features including ground water characterization.
- Climate including average annual precipitation, temperature and evaporation, prominent wind direction, and vegetation.

For Title I sites, if ground water monitoring is required, the LTSP summarizes Uranium Mill Tailings Remedial Action (UMTRA) Project ground water monitor well data if the wells (1) are specifically referenced in the text; (2) will be used in future ground water protection activities at the disposal site; or (3) are not planned for sampling but will remain at the disposal site after licensing.

For Title II sites, the ground water corrective action program, or if appropriate, alternative concentration limit (ACL) application, must be completed prior to site transfer to the DOE. Therefore, most ground water monitor well data and other related information will be incorporated into the LTSP by reference.

For all sites, a table that lists the monitoring locations and that provides relevant information for each location, such as formation of completion and depth of screened interval, is desirable. Springs or seeps that are used for monitoring should be identified. A site map should show monitoring locations used for background characterization.

In the context of the LTSP, background ground water quality represents the quality that would exist in the uppermost aquifer at the disposal site if neither the tailings disposal nor any previous uranium processing at the disposal site had occurred. For Title I sites, the LTSP summarizes and updates the RAP discussion on background ground water quality in the uppermost aquifer with respect to the basic properties of background ground water:

- Total dissolved solids.
- Major cations (e.g., sodium, magnesium, calcium) and anions (e.g., sulfate, chloride, bicarbonate).

- pH.
- Oxidation-reduction potential.
- Trace elements and constituents exceeding MCLs (Table 2-1).
- Range or variability in background water quality.
- Comparison to regional data, if available.

Table 2-1. Maximum Concentration of Constituents for Ground-Water Protection

Constituent	Maximum Concentration[a]
Arsenic	0.05
Barium	1.0
Cadmium	0.01
Chromium	0.05
Lead	0.05
Mercury	0.002
Selenium	0.01
Silver	0.05
Nitrate (as N)[c]	10
Molybdenum[c]	0.1
Combined radium-226 and radium-228	5 pCi/L
Combined uranium-234 and uranium-238[b,c]	30 pCi/L
Gross alpha-particle activity (excluding radon and uranium)	15 pCi/L
Endrin (1,2,3,4,10,10-hexachloro-6,7-exposy-1,4,4a,5,6,7,8,8a-octahydro-1,4-endo,endo-5,8-dimethanonaphthalene)	0.0002
Lindane (1,2,3,4,5,6-hexachlorocyclohexane, gamma insomer)	0.004
Methoxychlor (1,1,1-trichloro-2,2=-bis(p-methoxyphenylethane))	0.1
Toxaphene ($C_{10}H_{10}Cl_6$, technical chlorinated camphene, 67-69 percent chlorine)	0.005
2,4-D (2,4-dichlorophenoxyacetic acid)	0.1
2,4,5-TP Silvex (2,4,5-trichlorophenoxypropionic acid)	0.01

[a]Milligrams per liter, unless stated otherwise.
[b]Where secular equilibrium obtains, this criterion will be satisfied by a concentration of 0.044 milligrams per liter (mg/L). For conditions other than secular equilibrium, a corresponding value may be derived and applied, based on the measured site-specific ratio of the two isotopes of uranium.
[c]Title I sites only.
From Table 1 of 40 CFR Part 192, Subpart A and Table 5C of 10 CFR Part 40, Appendix A. pCi/L - picocuries per liter.

For Title II sites this information is included in the corrective action plan for sites undergoing ground water remediation or in the ACL application and supporting documents.

If the ground water protection strategy is based on a supplemental standard related to background ground water quality, the LTSP summarizes the basis for that determination.

An LTSP does not discuss potential changes in water quality due to failure of the disposal cell. An LTSP does summarize anticipated or reasonably possible changes in ground water conditions in the monitored aquifer at the disposal site and may discuss changes in ground water quality caused by the following:

- Impacts from disposal cell construction or drainage of the excess water from the disposal cell.

- Natural flushing or active remediation of existing ground water contamination at the site.

- Future land or water uses in the vicinity of the site.

- Short-term precipitation effects, cyclical seasonal variation, or long-term climatic influence.

2.3.3 Disposal Cell Design

The LTSP summarizes cell design and performance expectations and references appropriate sections of site-specific documents, including the RAP, reclamation plan, and completion report, for more information.

Title I and Title II disposal cells are designed to be effective for 1,000 years or at least 200 years, with no more than custodial maintenance (40 CFR §192.02(a)(d), 10 CFR Part 40, Appendix A, Criterion 6). An LTSP should summarize the following:

- Major constructed components of the disposal cell, including dimensions.

- A plan view and cross sections of the disposal cell.

- The cover system (i.e., rock or vegetative) drainage controls, and other features that contribute to cell performance.

- Design elements necessary for ground water protection.

- Other performance features (e.g., compaction densities, frost protection, infiltration, and cover drainage).

- The locations, coordinates, types, numbers, and figures of permanent site surveillance features including survey monuments, boundary monuments, site markers, entrance and perimeter signs, settlement plates, etc. Examples are provided in Attachment 2.

Field observations show that rock covers on UMTRA Project disposal cells support volunteer plant growth (DOE, 1992; Burt, 1995). Although this plant growth was not planned, it was acknowledged early in the UMTRA Project that some limited plant growth likely would occur on the cells (DOE, 1985). The common plant species growing on many of the disposal cells are known and should be described or referenced in the LTSP. The LTSP also should summarize or specify the locations of the following information:

- Status of volunteer plant growth on the cell and the anticipated plant succession, with an assessment of the long-term impact of these plants on cover integrity.

- Information (including field data) regarding the rooting patterns of some of the common plants observed on the rock-covered disposal cells (DOE, 1992; Burt, 1995), and data from the literature pertaining to rooting patterns of some common species observed at the sites (DOE 1995).

- Vegetation control measures used at the site.

- Conditions that may dictate the initiation or continued use of vegetation control measures.

2.3.4 Disposal Site Drawings And Photographs

The LTSP states that drawings, maps, and photographs are archived in the permanent site files and are accessible for review prior to site inspections. This information illustrates baseline conditions against which future conditions at the disposal site can be compared and evaluated. As-built drawings, baseline photographs, and aerial photographs are included in the descriptions of disposal site as-built conditions at the completion of remedial action or reclamation. The permanent site file contains vicinity maps, a topographic map, a disposal site map, and photographs of the site. The permanent site file is updated and maintained in accordance with records management procedures established by DOE.

2.4 Long-Term Surveillance Program Description

The LTSP describes the long-term surveillance program: inspection frequency, reports to NRC, inspection personnel qualifications, inspection procedures, frequency and extent of ground water monitoring (if required), appropriate constituent concentration limits for ground water, record keeping, and quality assurance procedures (10 CFR §40.27(b)(3), §40.28(b)(3)). The LTSP refers to cooperative agreements between the DOE and tribes, states, or former licensees, for direction on notifying, reporting, or other actions as appropriate.

2.4.1 Site Inspections, Scope, and Frequency

The LTSP describes disposal site inspections. The objectives of the site inspection are to report on the condition of the disposal cell, note any changes or modifications to the disposal cell and disposal site over time, and identify potential problems. The LTSP should state that all activities will be conducted in compliance with DOE-approved personnel health and safety programs. The inspection detects and documents progressive changes over several years as a result of slow-acting, natural processes. Additionally, the inspection should detect the results of intrusive human actions that can lead to a degradation of institutional control. Comparing baseline conditions recorded in the completion report to inspection findings provides a basis for determining cell performance.

An inspection is conducted at least annually at each disposal site, as required by 10 CFR Part 40, Appendix A, Criterion 12.

2.4.1.1 Inspection Team

The LTSP recommends the requirements for the site inspection team, including the need for technical specialists on the team based on the disposal site design, specific site surveillance requirements, or conditions expected at the site. A minimum of two inspectors comprises an inspection team. Team members should have the technical background and/or experience needed to evaluate physical conditions at the site.

2.4.1.2 Preparing for and Conducting an Inspection

The LTSP refers to this guidance document for recommendations on inspection preparation and conduct. Prior to conducting inspections, inspectors should:

- Review the RAP or reclamation plan, completion report, as-builts, and other appropriate documents listed in the bibliography attached to the LTSP.
- Review the LTSP, the permanent site file, previous site inspection reports, site inspection maps, and any maintenance or emergency measures reports.
- Notify NRC of the inspection.
- Advise state and tribal agencies, if required, and obtain permission to enter adjacent property, if necessary.

During an inspection, site inspectors must:

- Observe the condition of permanent features and anomalous or unexpected features that may require closer inspection (e.g., erosion features such as gullies or rills, sediment accumulations, vandalism, animal intrusion, plant growth).
- Record observations as necessary, in field notebooks and on site maps.
- Take and record photographs as necessary, to document conditions at the disposal site and to provide a continuous record for monitoring changing conditions over time.

2.4.1.3 Disposal Site Access and Security

The LTSP describes or refers to (1) DOE agreements with area landowners, tribes, or state or local agencies for permanent access to the disposal site (road rights-of-way), and for access to and use of areas outside the disposal site boundary to conduct ground water monitoring, if needed; and (2) how the DOE inspects off-site features identified for long-term surveillance. If Privacy Act requirements preclude the inclusion of some of this information in an LTSP, the location of the information is referenced.

The LTSP also identifies the need for prior notification or permission to access the site from non-DOE property, and for special provisions that may be needed to access the disposal site (e.g., obtaining keys to locked gates).

2.4.1.4 Inspection Checklist

An inspection checklist (Attachment 3) that addresses site-specific conditions should be developed and updated for each site. Prior to annual inspections, the previous inspection checklist should be reviewed and updated as needed. The checklist addresses site-specific conditions and requirements, including:

- Specific features to be inspected and photographed. For example, the area within approximately 0.25 mile (mi) (0.40 kilometer [km]) of the boundary of the disposal site;

evidence of human, plant, or animal activity; or geomorphic features (e.g., stream channels or gullies) that could initiate significant erosion.

- Unique cell design criteria requiring monitoring.
- Data that need to be recorded.
- Volunteer plant growth requiring identification and measurement.
- High water marks, areas of active erosion and sedimentation, and changes in channel position.

The checklist should be revised as needed to include new information or to delete items that are no longer pertinent.

2.4.1.5 Disposal Site and Disposal Cell Inspection

The LTSP refers to Attachment 4 of this guidance document for minimal and prudent disposal site and disposal cell inspection procedures that should be considered during planning for site inspections.

2.4.1.6 Inspection Reporting Requirements

The regulations (10 CFR Part 40, Appendix A, Criterion 12) require the DOE to annually submit the results of all site inspections to the NRC within 90 days of the last site inspection for a given calendar year. Any site where unusual damage or disruption is discovered during the inspection, however, will require a preliminary site inspection report to be submitted within 60 days.

The NRC-Uranium Recovery Branch and the DOE-Grand Junction Office have agreed to implement the reporting requirements as follows: One annual report discussing inspection results for all sites licensed under 10 CFR 40.27 (Title I sites) will be submitted and a separate annual report discussing inspection results for all sites licensed under 10 CFR 40.28 (Title II sites) will be submitted. Each report being subject to the reporting time limits mentioned above.

A copy of all site inspection reports will be maintained in the permanent site file.

2.4.2 Follow-Up Inspections

The NRC regulations require that the criteria for follow-up inspections in response to observations from routine inspections and extreme natural events must be included in the LTSP (10 CFR §40.27(b)(4), §40.28(b)(4)). The NRC is notified prior to the follow-up inspection if the reported problem indicates the disposal cell has been compromised or that extensive repair or emergency measures could be needed. Follow-up inspections will be conducted by technical specialists in the disciplines appropriate to the problem that has been reported.

Follow-up inspection reports may include:

- A description of the problem that triggered the follow-up inspection.

- A preliminary assessment of the maintenance, repair, or emergency measures required.
- Conclusions and recommendations.
- Assessment data, including field and inspection data, and photographs.
- Inspectors' names, qualifications, and signatures.

2.4.3 Ground Water Monitoring

The NRC regulations require that each LTSP describe the proposed frequency and extent of ground water monitoring, and appropriate constituent concentration limits for ground water (10 CFR §40.27(b)(3), §40.28(b)(3)).

An LTSP does not describe compliance activities for preexisting ground water contamination associated with uranium milling activities unless these activities could impact the ground water protection strategy of the disposal cell or the ability to assess these strategies. If so, they are summarized in the LTSP.

2.4.3.1 Disposal Sites Not Requiring Ground Water Monitoring

If ground water monitoring is not necessary at a disposal site, the rationale for no monitoring is summarized in the LTSP. This summary consists of the minimum description of the ground water characteristics needed to support the summary. It references appropriate documents for more information on ground water characteristics and the justification for not performing ground water monitoring at or near the site.

2.4.3.2 Disposal Sites Requiring Ground Water Monitoring

The water sampling and analysis plan for each site should be summarized or referenced in the LTSP. Ground water samples will be collected in compliance with the most recent DOE-approved standard operating procedures. The LTSP will specify the frequency, extent, and locations of ground water sampling.

Ground water monitoring data should be analyzed to determine if the cell is functioning as designed.

2.4.4 Custodial Maintenance or Repair

The LTSP identifies routine or reasonably anticipated custodial activities, the timing and frequency with which they are performed, and the manner in which the work is authorized (10 CFR §40.27(b)(5), §40.28(b)(5)). The following examples of maintenance or repair may be specified.

- Planned maintenance: grass mowing, road maintenance, removal of weeds or debris, vegetation control, or replacement of signs.
- Unscheduled maintenance: removal of deep-rooted or other unwanted vegetation on the disposal cell.

- Repair: damage to disposal cell, fence, gate or locks, surveillance features, wells or roads.
- Repair: Deterioration of disposal site erosion protection materials.
- Repair: Mitigation of modifying processes that could eventually compromise disposal cell integrity.

Failure of planned vegetation to establish within a specified amount of time may warrant further analysis and action.

The LTSP describes custodial care certification and reporting requirements. At a minimum, the party that performs the work provides DOE with verification of the work. DOE inspects the work and certifies that it was completed in accordance with the specifications. Documentation of the custodial maintenance or repair is included in the annual report to the NRC.

A record of the custodial work documented and incorporated in the permanent site file includes:

- Summary of work required (statement of work).
- Procurement documents (drawings, specifications, subcontract).
- Documentation of completion of work.

2.4.5 Emergency Measures and Ground Water Corrective Actions

The difference between maintenance/repairs and emergency measures is determined by the cause and magnitude of the problem, the immediate threat to the public or the environment, and the need to comply with applicable standards.

The site inspectors evaluate the problem and make recommendations for the next step (e.g., immediate action or continued evaluation). Recommendations for the next step will be determined as follows: (1) DOE will assess the design bases governing the adequacy of the damaged site feature and the ability of the site design to control or accommodate the observed problems; (2) DOE will determine the extent of the damage or degradation and will compare existing conditions to design conditions; (3) as necessary, DOE will evaluate the existing conditions to determine if a design basis event can be withstood by the feature in its existing condition; and (4) DOE will provide to NRC (in either the annual report or a separate report) a clear and technically defensible basis for concluding that remedial measures are or are not necessary. After the NRC reviews the report and its recommendations, the DOE prepares a plan and submits it to the NRC. Emergency measures begin after the NRC has concurred with the plan.

NRC regulations do not specify a time frame for implementing emergency measures. However, the relative severity and imminence of threat to the public health and safety or the environment, will dictate how quickly action must be taken.

For ground water corrective actions, the EPA ground water standards require that a corrective action program must be in operation no later than 18 months after a finding of exceedance

(40 CFR §192.04, §192.33). Assessing the extent of the problem and developing a corrective action plan is not considered initiation of the corrective action program.

The following examples of disposal site conditions may require emergency measures:

- Surface rupture of the disposal cell, such as cracks, indications of differential settlement, or severe shrinkage of the cover materials.

- Subsidence, sliding, or slope instability on the disposal cell (caused by mass wasting, liquefaction, differential settlement, or other events).

- Development of rills or gullies considered an actual or potential breach to cell integrity.

- Deterioration to the point of imminent failure of the erosion protection rock on the disposal cell or in the drainage ditches.

- Seepage originating from the disposal cell.

- Development of gullies on or adjacent to disposal site property that could affect the integrity of the disposal cell.

- Rapid headward cutting of a nearby gully, arroyo, or ravine that threatens the stability of the disposal cell.

- Encroachment of stream channels onto the disposal site.

- Damage to the cell cover or disposal site property because of river encroachment, seismic events, flooding, catastrophic events, volunteer plant growth, or vandalism (removal of cell construction materials).

- Ground water quality degradation may require corrective action.

The LTSP discusses certification of emergency measures or corrective actions and the reporting requirements for the progress of the actions. The NRC reviews the progress reports, which may be appended to the site inspection and/or annual report. After the action is completed, all work is certified by the DOE in accordance with the design specifications. The NRC reviews the certification that the emergency repair or corrective action is acceptable. All reports, data, and documentation generated during the emergency measures or corrective action, including a copy of the certification statement, are retained in the permanent site file.

2.4.6 Record Keeping

The LTSP identifies and summarizes the DOE-approved record keeping requirements that apply to LTSP documentation. DOE updates and maintains the following documents:

- The DOE's annual report to the NRC documenting the results of the inspections as required by 10 CFR §40.27(b)(3) and 10 CFR §40.28(b)(3) for Titles I and II, respectively.

- Files and original deeds, custody agreements, and other property documents.

- Surveillance and maintenance documentation.
- Emergency measures records.
- Ground water corrective action records.
- Other documents deemed important by DOE.

Records, including the permanent site file, will be managed and maintained in accordance with schedules and procedures established by the National Archives and Records Administration (NARA) and DOE Order 1324.5B, *Records Management*.

2.4.7 Emergency Notification and Reporting

An LTSP includes copies of agency agreements and emergency and reporting procedures (e.g., the DOE agreement with the U.S. Geological Survey National Earthquake Information Service to notify the DOE in the event of an earthquake in the disposal site area). Attachment 5 provides the criteria for earthquake reporting requirements.

The LTSP states that if a site-related emergency requires public notification, the DOE takes appropriate action to notify individuals who may be affected and advise them of precautions that should be taken. Local law enforcement officials, news media, DOE and NRC representatives, and tribal or state representatives are included in this process. Nothing in the LTSP may negate or override DOE occurrence reporting requirements.

The designated facility contact telephone number also is posted on the site entrance sign (DOE 24-hour number), allowing area residents to contact the DOE when problems are discovered.

2.4.8 Quality Assurance

The LTSP refers to DOE quality assurance requirements that must be followed during implementation of the surveillance and maintenance program, including DOE Order 414.1A, *Quality Assurance*.

3.0 References

Burt, C., 1995. Jacobs Engineering Group Inc., personal communication with S. Cox, Jacobs Engineering Group Inc., UPDCC File Location No. 5.15.1.1, Albuquerque, New Mexico, 5 October 1995.

DOE (U.S. Department of Energy), 1995. *UMTRA Project Disposal Cell Cover Biointrusion Sensitivity Assessment*, DOE/AL/62350-200, Rev. 1, prepared for the U.S. Department of Energy, Environmental Restoration Division, UMTRA Project Team, Albuquerque, New Mexico.

DOE (U.S. Department of Energy), 1992. *Vegetation Growth Patterns on Six Rock-Covered UMTRA Project Disposal Cells*, DOE/AL-400677.0000, prepared for the U.S. Department of Energy, UMTRA Project Office, Albuquerque Operations Office, Albuquerque, New Mexico.

DOE (U.S. Department of Energy), 1985. *Technical Summary of the UMTRA Project Technology Development Program (1980-1984)*, UMTRA-DOE/AL-200125.0000, prepared for the U.S. Department of Energy, UMTRA Project Office, Albuquerque Operations Office, Albuquerque, New Mexico.

EPA (U.S. Environmental Protection Agency), 1992. *Addendum to Interim Final Guidance, Statistical Analysis of Ground-Water Monitoring Data at RCRA Facilities*, Office of Solid Waste Management Division, U.S. Environmental Protection Agency, Washington, D.C.

Code Of Federal Regulations

10 CFR Part 40, *Domestic Licensing of Source Material*, U.S. Nuclear Regulatory Commission.

40 CFR Part 192, *Health and Environmental Protection Standards for Uranium and Thorium Mill Tailings,* U.S. Environmental Protection Agency.

DOE Orders

Order 414.1A, *Quality Assurance*, September 29, 1999, U.S. Department of Energy, Washington, D.C.

Order 1324.5B, Records Management, July 19, 1996, U.S. Department of Energy, Washington, D.C.

United States Code

42 USC Section 7901 *et seq., Uranium Mill Tailings Radiation Control Act of 1978*, November 8, 1978.

End of current text

Attachment 1

U.S. Nuclear Regulatory Commission Regulations
(10 CFR §40.27, §40.28, and §40 Appendix A)

INSTRUCTIONS ON ACCESSING THE U.S NUCLEAR REGULATORY COMMISSION REGULATIONS THAT ARE INCLUDED IN ATTACHMENT 1:

1. Double click on the URL below
   http://www.access.gpo.gov/nara/cfr/waisidx_98/10cfr40_98.html

2. To view the General license for custody and long-term care of residual radioactive material disposal sites, **select 40.27**.

3. To view the General license for custody and long-term care of uranium or thorium byproduct materials disposal sites, **select 40.28.**

4. To view Appendix A to Part 40—Criteria relating to the operation of uranium mills and the disposition of tailings or wastes produced by the extraction or concentration of source material from ores processed primarily for their source material content**, select 40.82**.

Attachment 2

Samples of Permanent Site Surveillance Features

List of Tables

Page

List of Figures

Page

Table A2.1. Example Locations of Disposal Site Permanent Surveillance Features

Feature	Location Coordinates[a]
Site Markers	
SMK-1	N 14,678; E 12,600
SMK-2	N 15,539; E 12,974
Survey/Boundary Monuments	
SM-1/BM-1	N 15,002; E 14,326
SM-2/BM-2	N 16,648; E 14,321
SM-3/BM-3	N 16,663; E 12,500
Boundary Monuments	
BM-4	N 16,394; E 11,660
BM-5	N 15,828; E 11,662
BM-6	N 15,343; E 11,996
BM-7	N 15,009; E 11,998
BM-8	N 14,685; E 11,999
BM-9	N 14,684; E 12,326
BM-10	N 14,679; E 13,632
BM-11	N 14,897; E 14,327
Background Well	
GUN08-0716	N 17499; E 13,216
POC Wells	
POC-1	N 15,500; E 12,375[b]
POC-2	N 16,125; E 12,625[b]
POC-3	N 16,375; E 13,250[b]
POC-4	N 15,750; E 13,675[b]
POC-5	N 15,500; E 13,500[b]
POC-6	N 15,000; E 13,375[b]

[a]Coordinates in feet based on Project Survey Control Point (N 15,000; E 15,000 - modified Colorado State Plane Coordinate System).
[b]Estimated coordinates based on tentative well locations.

From MK-ECE, 1995.

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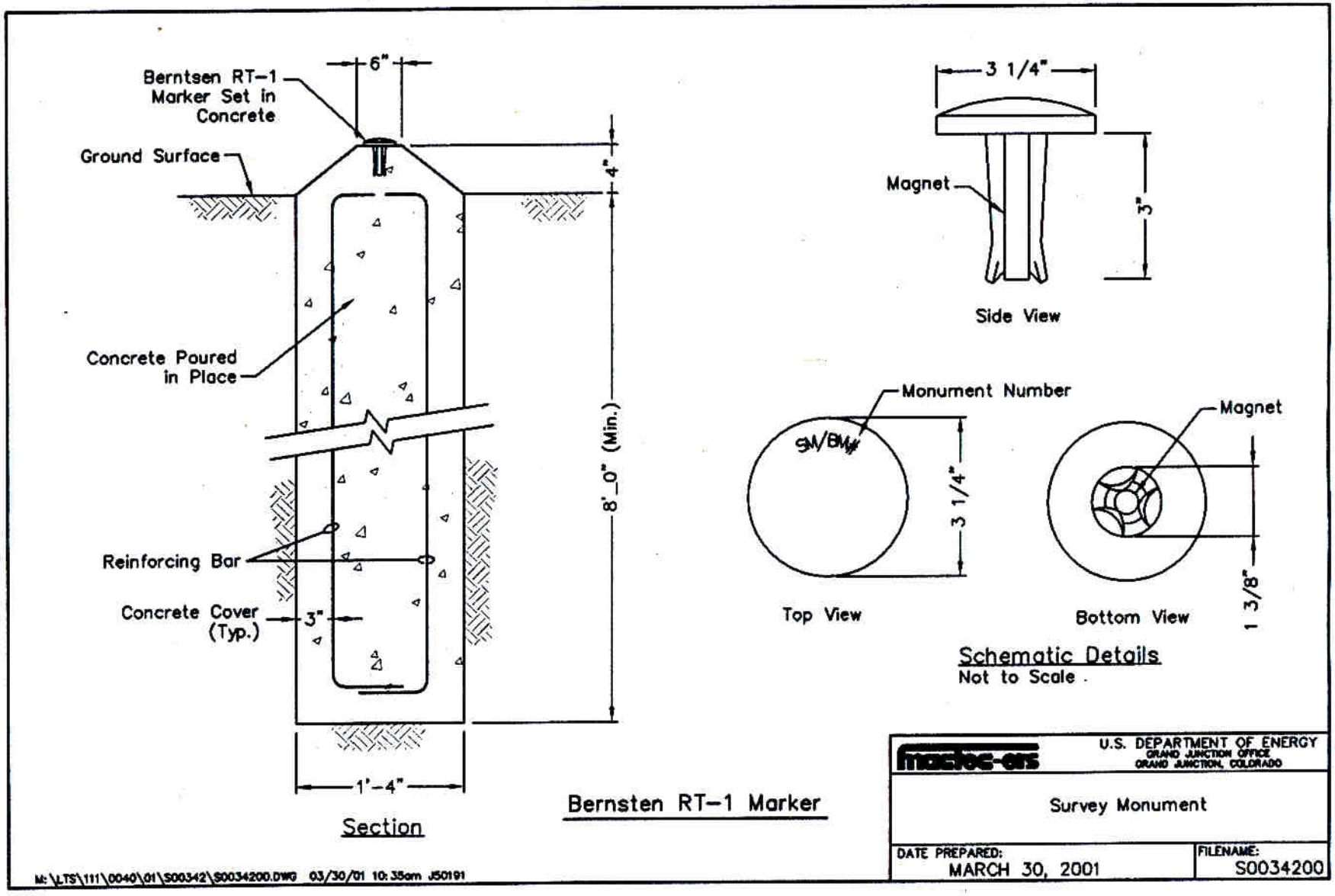

Figure A2.1 Example Disposal Site Survey Monument

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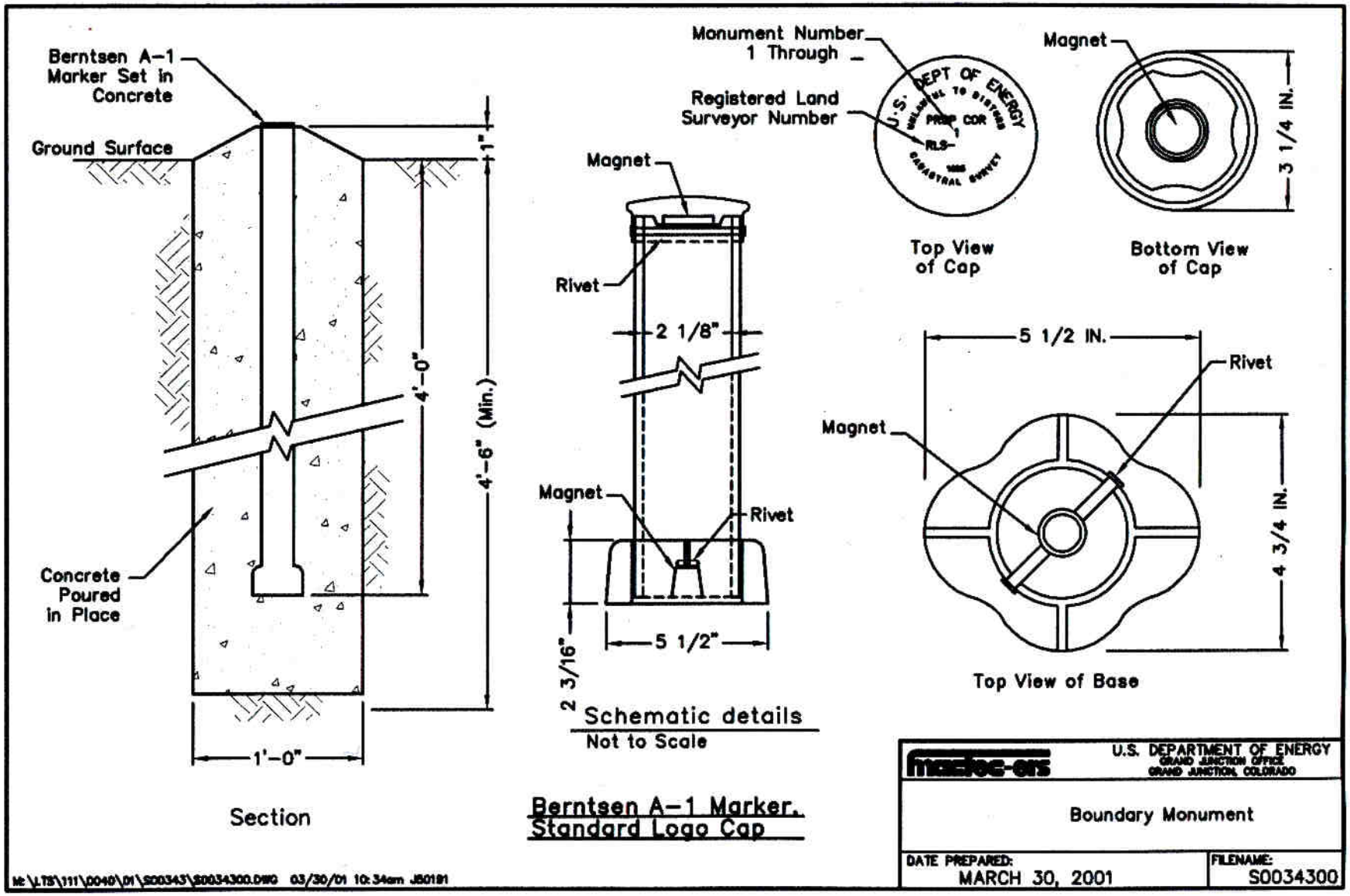

Figure A2.2 Example Disposal Site Boundary Monument

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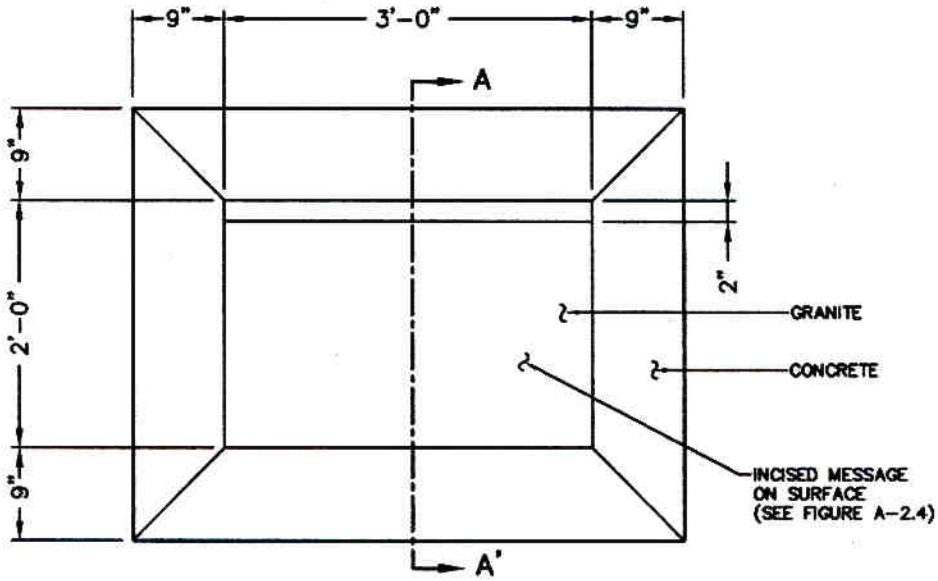
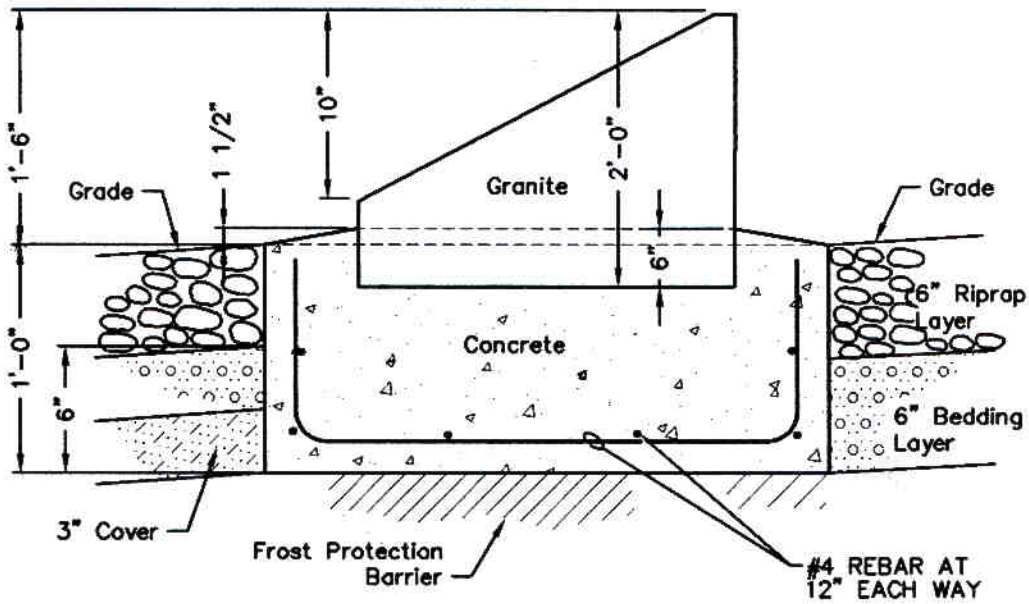


PLAN VIEW
NOT TO SCALE



SECTION A–A'
NOT TO SCALE

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Site Marker	
DATE PREPARED: APRIL 2, 2001	FILENAME: S0034400

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Figure A2.3 Example Disposal Site Marker

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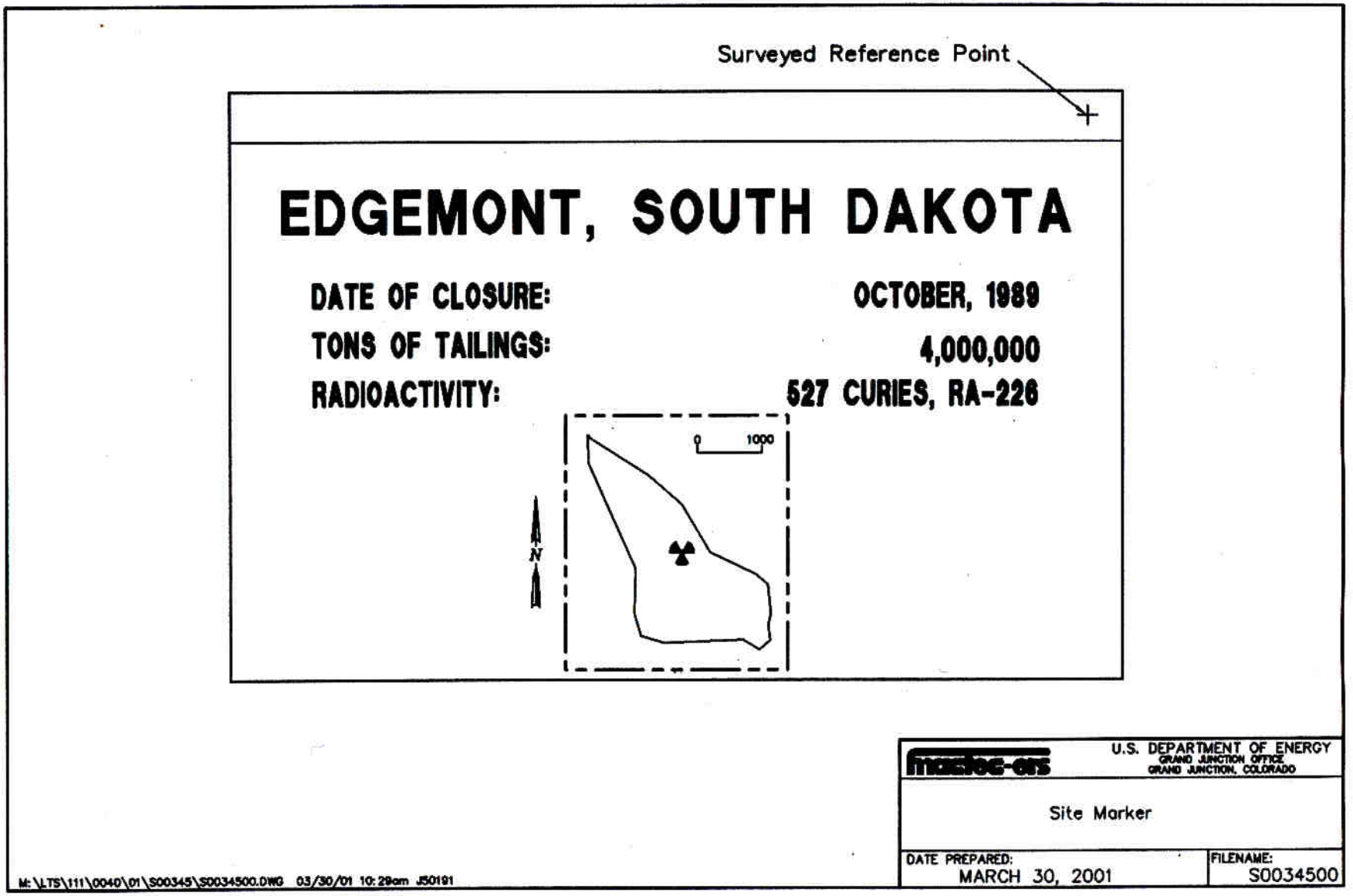

Figure A2.4 Example Disposal Site Marker Message

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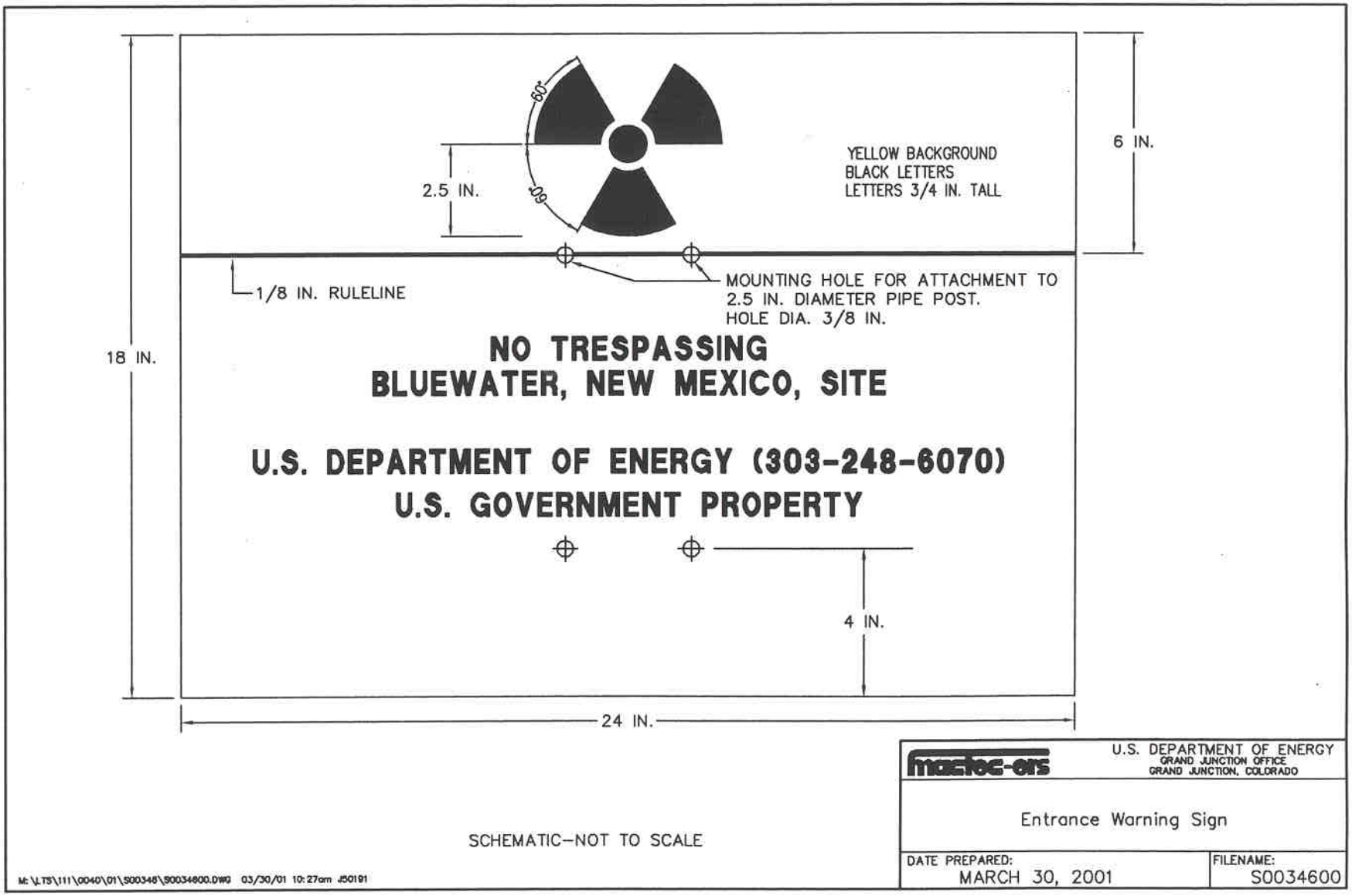

Figure A2.5 Example Disposal Site Warning Sign

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Attachment 3

Sample Inspection Checklist

SITE STATUS REPORT (CHECKLIST) AND JOB SAFETY ANALYSIS

RIFLE

Status of Site Inspections

Last Update of This Status Report:	August 3, 1998
Last Annual Inspection:	August 13-14, 1998
Inspectors	M. Plessinger (Chief) and J. Waugh
Next Annual Inspection:	Week of August 3, 1998
Last Follow-Up Inspection	May 14, 1998 to investigate cattle inside the fence

Issues and Issue Resolution

The 1997 inspection was the V&O inspection. Review the 1997 inspection report for baseline information.

1. Fencing

   ERD-UMTRA relied on topography and inadequate fencing to keep cattle from adjoining grazing lease off the site. Rancher reported in May that he was unable to keep his cattle out. GJO paid for materials and the rancher, as subcontractor, installed a new section of fence from about P11 due north into the edge of the riprap.

   Resolution: Evaluate adequacy of fencing to keep cattle off revegetated areas of the site. There may be a problem along the southwest edge of the site where the fence ends at a gully.

2. Survey Monuments

   Three survey monuments were not found during the V&O inspection.

   Resolution: Survey monuments are not as important as boundary monuments. Nevertheless, attempt to locate the missing survey monuments at approximate locations shown on Plate 1.

3. Boundary monuments

Corners:	20
Boundary monuments:	15, according to the LTSP
Found in 1997:	13 monuments

Boundary monuments, BM-3 and BM-18 were not found during the V&O inspection.

Resolution: Attempt to locate the two missing boundary monuments at approximate locations shown on Plate 1.

4. Erosion

Erosion at the base of the toe drain outlet is anticipated in the design. The outlet should self-armor as erosion removes finer materials down to the base of the large riprap.

Resolution: Evaluate.

5. Reseeded Areas

Graded and disturbed areas south of the disposal cell were reseeded.

In 1997, revegetated areas south of the disposal cell were in excellent condition. Areas surrounding the disposal cell, SMK-1, and the area south of the site boundary, where materials were stockpiled, were not reseeded until the spring of 1997, and plants were too immature to evaluate.

Resolution: Reinspect.

6. South Drainage Gully

In 1997, Inspectors recommended that a riprap-armored drainage gully south of the site should be added to Plate 1 in the LTSP. Needless to say, this did not happen.

Resolution: Re-evaluate. If the need still exists, include a sketch of the gully in relation to the site in the trip report.

7. Noxious Weeds

Spotted knapweed (noxious) and musk thistle (undesirable) may be present.

Resolution: Report if present. Consider collecting specimens in large zip-lock bags for positive identification.

8. Emergency Services

We don?t have information on these services for the Rifle area.

Resolution: Inspectors should please obtain telephone numbers for the JSA when in the Rifle area.

Specific Site Surveillance Features: RIFLE

Identifier	Feature		Comment
—	Entrance Gate		
—	Entrance Sign	1	
P1, P2, etc.	Perimeter Signs	26	
SMK	Site Markers	2	
SM	Survey Monuments	3	Not found in 1997
BM	Boundary Monuments	15(?)	BM-3 and BM-18 not found in 1997
—	BLM witness corner		Not a specific site surveillance feature
???	Standpipes	3	Labeled as MW's on 1997 inspection drawing, symbol: o. Add symbol to legend.
MW	Monitor Wells	9	All to be abandoned. Inspect as time permits. Report new wells if encountered
—	Settlement Plates	?	Not a specific site surveillance feature

LTSM Job Safety Analysis

Site Rifle, Colorado		**JSA Number** RFL-98-1	
Task Annual Prelicensing Site Inspection			
Prepared by C. A. Jones	**Date** 08/03/98	**Reviewed by**	**Date**

Site Hazards

-Large area of rough, irregular riprap
-Rapid changes in weather conditions. Electrical storms. Precipitation possible. Consult forecast.
-Wood (and Lyme?) ticks, other bugs possible

Protective Clothing Required/Suggested

-Sturdy boots with ankle support are recommended
-Personnel clothing appropriate to changeable spring weather

Protective Equipment Required/Suggested

-Drinking water
-Personal items such as sunscreen, sunglasses, insect repellant
-First-aid kit

Medical & Emergency Service Information	
Police	911
Ambulance	911
Sheriff	911
Fire	911
Clagett Memorial Hospital 710 East 5th Rifle	911 or 970-625-1510

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Attachment 4

Disposal Site and Disposal Cell Inspection Techniques

Disposal Site and Disposal Cell Inspection Techniques

An effective way to initiate inspection of the disposal site area and disposal cell is with a series of well-planned traverses around the perimeter of the disposal site, and along the base, sideslopes, and crest of the disposal cell and diversion channels. The number of traverses along the sideslopes is determined by the height of the disposal cell. Sideslope traverses generally should be spaced at 50-yard (46-meter [m]) intervals. Traverses across the disposal cell crest should be diagonal to its long axis. At a minimum, the site perimeter and site area traverses should be selected to observe damage or disturbance to the following features:

- Site perimeter roads.
- Fences, gates, and locks.
- Permanent site-surveillance features.
- Ground water monitor wells and other monitoring points.
- Other instrumentation or surveillance features.
- Site area vegetation or volunteer plant growth.
- Sedimentation or erosion.
- Lateral stream cutting or channel migration.

Traverses along the engineered component (diversion ditches, cell sideslopes, cell crest, and cover) should be walked along their complete length and examined for evidence of the following:

- Structural instability caused by differential settlement, subsidence, cracking, sliding, or creep.
- Erosion evidenced by the development of rills or gullies.
- Sedimentation or debris.
- Rapid deterioration of rock caused by weathering or erosion.
- Removal of rock or other disposal cell material.
- Seepage.
- Intrusion (inadvertent or deliberate) by humans or animals (burrowing).
- Vandalism.

- Development of trails from human or animal activity.

- Volunteer plant growth, especially on the disposal cell or in the diversion channels.

- Erosion of vegetation if the site area or disposal cell cover is vegetated.

Modifications due to natural processes are most likely to occur on the lower portion of the sideslopes of the disposal cell. These modifications include gullying and headward erosion, cracking, landslides, creep, piping, sheet erosion, sedimentation or deflation, animal and plant intrusion, and extreme natural events (e.g., tornadoes or earthquakes). The site inspectors should know how to recognize, quantify, and record these processes for future evaluation. If any modifying features are observed during the inspection, the following data should be recorded briefly on the inspection checklist and fully discussed in the inspection report:

- Extent of area affected, stability, and nature of movement (e.g., planar or rotational).

- Number of features, spacing, length, depth, and width.

- Related erosional features.

- Patterns of occurrence.

- Species present (if plants or animals are found on the site).

- Location and density of volunteer plant growth.

Inadvertent or casual intrusion by humans or animals is not of great concern, but evidence of removal of the cover, extensive vandalism to signs and monuments, or the presence of well-established trails should be described in detail. Continuing vandalism may require more active measures to control access to the site.

If new conditions requiring continuing observation, monitoring, or immediate action are discovered during the inspection, a description of the problem and recommended follow-up actions, if required, should be included in the inspection report.

Some disposal cells have vegetated rather than rock covers. A plant specialist should participate in the inspection if circumstances warrant. If timing of the inspection conflicts with the overall schedule for other site inspections, a plant specialist or other qualified person may conduct a separate inspection at a more optimum time of year. The condition of expected plant growth could affect the timing of the aerial photography. The areas around the disposal cells are recontoured and seeded at the end of remedial action. The LTSP discusses the seed mix needed to revegetate the recontoured area.

At disposal cells with rock covers, volunteer plant growth may be observed during the inspection. If an unknown plant species is encountered by a qualified inspection team member, biologists from the Soil Conservation Service or Bureau of Land Management or botanists from a local college or university could be contacted. Also, samples of the plant species in question may be collected and taken into the office for identification.

The inspection team's determination of plant density on the disposal cell likely will be subjective. The inspection team should determine if there are areas of moderate-to-dense vegetation growth on the disposal cell. At the Shiprock disposal cell, coverage of 10 to 25 plants per 100 square feet (ft^2) (9 square meter [m^2]) is considered moderate and coverage of more than 25 plants per 100 ft^2 (9 m^2) is considered densely vegetated (DOE, 1992). If moderately to densely vegetated areas are noted, further study may be warranted.

The need for further study also is dictated by site conditions. For example, if there is a 7 ft (2 m) frost protection layer above the infiltration/radon barrier and the plant species growing on the disposal cell likely would not grow that deep, further investigation may not be warranted. However, if there is 1 to 3 ft (0.3 to 1 m) of cover above the infiltration/radon barrier layer, further study may be required. Further study could include a more detailed analysis of the rooting patterns of the species in question based on an analysis of existing information.

The concept of using the ratio of rooting depth to shoot height to determine the rooting depth of species observed in the field is discussed in the disposal cell cover biointrusion sensitivity assessment (DOE, 1995). This report provides the rooting depth to shoot height for some common species observed on the disposal cells. This ratio used with knowledge of the cover characteristics may help field inspectors determine if vegetation control measures are required. This ratio should be used with caution to determine site-specific vegetation control measures because rooting depth for some of the common species growing on the disposal cells may be density-dependent. Vegetation control measures based on the root-to-shoot ratio should be determined by individuals familiar with this concept and its limitations.

Field studies show that plant growth on some rock disposal cells is sparse (e.g., the Green River and Clive, Utah, cells) while plant growth on other rock-covered cells is more extensive (e.g., Shiprock, New Mexico; Burrell, Pennsylvania; and Cheney, Colorado). These studies also show that plant roots have grown into the infiltration/radon barrier layer at some of the disposal cells (DOE, 1992; Burt, 1995). The impacts of plant root growth into this layer have not been determined although studies on the UMTRA Project and elsewhere indicate that such plant root growth could result in an increase in radon emanation from the disposal cell (DOE, 1995; Morris and Fraley, 1989). Other potential impacts from plant biointrusion into the disposal cell include increased water infiltration into the cell, breakdown of the engineered cover system, and transport of other contaminants out of the cell.

Because the rooting patterns of a given plant species may vary with ecological conditions and from species to species, the analysis of plant growth on the cells must be addressed on a site-by-site basis. A species that altered its rooting pattern based on varying conditions is the summer cypress at the Cheney disposal cell. A 4.5-ft (1.4-m) tall summer cypress was excavated from a sparsely vegetated area (plants at least 10 ft [3 m] apart); its rooting depth was 14 inches (36 centimeters [cm]). A 32-inch (81 cm) tall summer cypress excavated in a densely vegetated area had extended roots 25 inches (64 cm) into the cover (the depth of the excavation); small roots continued down into the cover for an additional undetermined depth (Burt, 1995). The rooting depth-to-shoot height ratio of summer cypress was determined to be 1 to 1 although rooting depth can be highly variable (DOE, 1995). The summer cypress from the sparsely vegetated area had a root depth-to-shoot height ratio of 0.3 to 1 while this same ratio in the densely vegetated area was probably about 1 to 1. Although in this example a root-to-shoot ratio

of 1 to 1 would be conservative, data indicate that rooting depth appears to increase with plant density.

References

Burt, C., 1995. Jacobs Engineering Group Inc., personal communication with S. Cox, Jacobs Engineering Group Inc., UPDCC File Location No. 5.15.1.1, Albuquerque, New Mexico, 5 October 1995.

DOE (U.S. Department of Energy), 1995. *UMTRA Project Disposal Cell Cover Biointrusion Sensitivity Assessment*, DOE/AL/62350-200, Rev. 1, prepared for the U.S. Department of Energy, Environmental Restoration Division, UMTRA Project Team, Albuquerque, New Mexico.

DOE (U.S. Department of Energy), 1992. *Vegetation Growth Patterns on Six Rock-Covered UMTRA Project Disposal Cells*, DOE/AL-400677.0000, prepared for the U.S. Department of Energy, UMTRA Project Office, Albuquerque Operations Office, Albuquerque, New Mexico.

Morris, R. C., and L. Fraley Jr., 1989. "Effects of Vegetation, a Clay Cap and Environmental Variables on Rn-222 Fluence Rate From Reclaimed Mill Tailings," *Health Physics*, Vol. 56, pp. 431-440.

Attachment 5

Earthquake Reporting Criteria

List of Acronyms

Acronym	Definition
DOE	U.S. Department of Energy
NEIC	National Earthquake Information Center
UMTRA	Uranium Mill Tailings Remedial Action
USGS	U.S. Geological Survey

Earthquake Reporting Criteria

The U.S. Geological Survey (USGS) National Earthquake Information Center (NEIC) will notify the U.S. Department of Energy (DOE) when an earthquake of a specified magnitude is reported within a specified radius of a Uranium Mill Tailings Remedial Action (UMTRA) Project disposal site.

In determining a specific magnitude of earthquake or a site radial distance significant to a specific site, the following limitations of these parameters should be understood:

- Ground conditions resulting from severe weather (such as recent heavy rains) may cause variations in ground response at the site.

- The accuracy of the distance and attenuation relationships may vary due to local structure and stratigraphy.

- The accuracy of the reported magnitude and epicentral distance depends on the number and proximity of the reporting seismic stations, and quality of the data.

- The significance of regional earthquakes may depend on the orientation of the structure associated with an earthquake relative to the site. An earthquake on a fault that trends near the disposal site has implications for possible focusing of the ground response and migration of future aftershocks closer to the site.

The variability of the potential ground response and the need to review the significance of regional earthquakes relative to known or unknown structures suggest the minimum acceleration of 0.10 gravitational acceleration for long-term and short-term design should be used to define the significant radial distance from the site for a seismic event notification. The distance acceleration relationship of Campbell (1981) is recommended in the technical approach document (DOE, 1989) for the western United States, and the relationship applicable to the central United States is taken from Nuttli and Hermann (1978).

Figure A-5.1 identifies the radius relative to the magnitude of earthquakes that would trigger the NEIC notification process to DOE. These radii and magnitudes are applicable to all disposal sites, regardless of seismic design of specific sites. Table A5.1 provides the design magnitude and peak acceleration for each site used to develop the notification criteria identified in Figure A-5.1.

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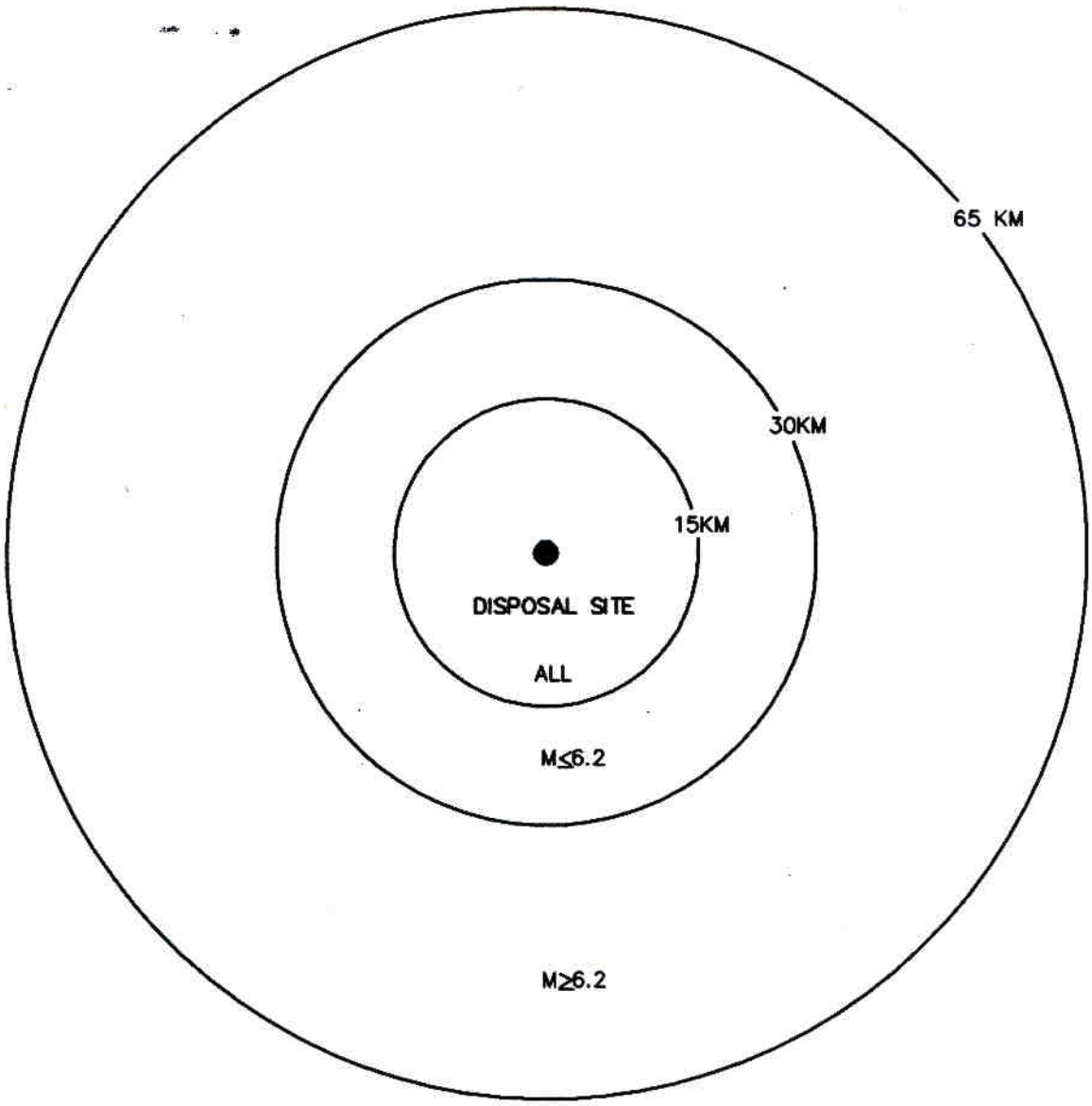

REPORTABLE EARTHQUAKE FOR SPECIFIED RADIAL DISTANCES FROM DISPOSAL SITES

DISTANCE	MAGNITUDE
0–15 KM	ALL (DETECTABLE)
0–30 KM	6.2 OR LESS
0–65 KM	6.2 OR GREATER

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EARTHQUAKE MAGNITUDES	
DATE PREPARED: MARCH 30, 2001	FILENAME: S0034700

Figure A-5.1. Reportable Earthquake Magnitudes for Specified Radial Distances From an UMTRA Project Disposal Site

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Table A-5.1 Earthquake Data for the UMTRA Project Disposal Sites

Disposal Site	Latitude	Longitude	Design earthquake (M_L)	Peak acceleration(g)
ARIZONA				
Tuba City	N36.15	W111.10	6.2	0.21
COLORADO				
Durango (Bodo Canyon)	N37.15	W107.90	a	0.16
Grand Junction (Cheney)	N38.91	W108.32	6.0	0.34
Gunnison (Landfill)	N38.51	W106.85	6.2	0.21
Maybell	N40.55	W107.99	6.2	0.21
Naturita (Dry Flats)	N38.21	W108.60	7.1	0.25
Rifle (Estes Gulch)	N39.60	W107.82	6.2	0.21
Slick Rock (Burro Canyon)	N38.05	W108.87	6.2	0.21
IDAHO				
Lowman	N44.16	W115.61	7.0	0.34
NEW MEXICO				
Ambrosia Lake	N35.41	W107.80	6.2	0.21
Shiprock	N36.80	W108.65	5.75	0.13
NORTH DAKOTA				
Bowman	N46.23	W103.55	6.0	0.15
OREGON				
Lakeview (Collins Ranch)	N42.2	W120.3	7.5	0.52
PENNSYLVANIA				
Canonsburg	N40.26	W80.25	a	0.10
Burrell VP	N40.62	W79.65		0.10
TEXAS				
Falls City	N28.91	W98.13		0.10
UTAH				
Green River	N39.0	W110.1	6.2	0.21
Mexican Hat	N37.10	W109.85	6.2	0.21
Salt Lake City (Clive)	N40.69	W113.11	7.1	0.31
WYOMING				
Spook	N43.23	W105.63	6.2	0.21

[a]The seismic design for the Canonsburg, Burrell, and Durango disposal sites was based on a probabilistic approach of potential acceleration and did not assign a design magnitude.

Notes: 1. The specific locations of the disposal cells are in parentheses.
2. The Belfield and Monument Valley tailings are codisposed at the Bowman and Mexican Hat sites, respectively.
3. The Riverton tailings were removed to a Title II site in Wyoming.

VP - vicinity property
.g - gravitational acceleration 32.2 feet per second per second.
M_L - local magnitude.

References

Campbell, K. W., 1981. "Near-Source Attenuation of Peak Horizontal Acceleration," *Bulletin of the Seismological Society of America*, Vol. 71, pp. 2039-2070.

DOE (U.S. Department of Energy), 1989. *Technical Approach Document*, UMTRA-DOE/AL-050425.0002, DOE UMTRA Project Office, Albuquerque Operations Office, Albuquerque, New Mexico.

Nuttli, O. W., and R. B. Hermann, 1978. "State-of-the-Art for Assessing Earthquake Hazards, Report 12, Credible Earthquakes for the Central United States: U.S. Army Engineer Waterways Experiment Station,"Miscellaneous Paper S-73-1, Report 12.

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